

*WATERSIPORA ARCUATA*, A NEW SPECIES  
IN THE *SUBOVOIDEA-CUCULLATA-NIGRA* COMPLEX  
(BRYOZOA, CHEILOSTOMATA)

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**ABSTRACT:** A new species, *Watersipora arcuata*, is proposed for the species usually identified as *W. nigra* Soule (1961), which differs from the holotype of *Pachycleithonia nigra* Canu and Bassler (1930) in its smaller size, an arcuate proximal border to the aperture, the distribution of interzoidal communication pores, possession of a basal window, and in other respects. A synonymy and detailed description of the species and its variations is given. The type locality is in San Diego, California.

INTRODUCTION

Hastings (1930) described several morphological variants of a species complex she designated *Watersipora cucullata* (Busk), commenting that the complex probably consisted of several species. Among the forms involved was one with an arcuate, concave proximal border to the aperture and operculum (Hastings, 1930, pl. 15, fig. 101). Osburn (1952) considered this form a subspecies of *W. cucullata*. Since the type was not available at the time (D. F. Soule, pers. comm., 1968), Osburn presumed that the form was identical to *Pachycleithonia nigra* Canu and Bassler (1930) and named it *W. cucullata*, var. *nigra* (Canu and Bassler). Soule (1961) agreed with Osburn's generic placement of the form, but raised it to species rank, designating it *Watersipora nigra* (Canu and Bassler). Hastings (in litt. to D. F. Soule, 1964) compared the type specimen of Busk's *Lepralia cucullata* to Soule's specimens and agreed the species are distinct.

At the suggestion of Dr. J. D. Soule, Dr. D. F. Soule and Miss P. L. Cook (see also Cook, 1968: 184), I have examined the type specimen of *P. nigra* Canu and Bassler and concur that *W. nigra* Soule (1961) is a distinct species; a new name, *Watersipora arcuata*, is therefore proposed, referring to the characteristic concave proximal border of the aperture.

***Watersipora arcuata*, new species**

Figures 1-4

*Watersipora cucullata* (Busk): Hastings 1930: 729, pl. 15, fig. 101 (in part). Galapagos Islands. [Not *Lepralia cucullata* Busk 1854: 81].

*Watersipora cucullata* (Busk), var. *nigra* (Canu and Bassler): Osburn 1952: 473, pl. 56, figs. 3, 5. Gulf of California. [Not *Pachycleithonia nigra* Canu and Bassler, 1930: 24].

*Watersipora cucullata* (Busk): Wisley 1958: 363, fig. 1. Australia.

*Watersipora cucullata* (Busk): Skerman 1960a: 615, fig. 1; 1960b: 620, figs. New Zealand.

*Watersipora nigra* (Canu and Bassler): Soule 1961: 47. Gulf of California.

*Watersipora nigra* (Canu and Bassler): Soule and Soule 1964: 35, figs. 11 and 12. Western Baja California.

*Watersipora nigra* (Canu and Bassler): Banta 1968: 497, pl. 1, figs. 1-9; 1969a; 1969b. California.

*Type locality.* Southwestern Yacht Club Marina, near Point Loma, San Diego Bay, San Diego, California. Specimens collected alive January 19, 1967, by the author from floating dock facilities.

*Holotype.* Colony fragments fixed in 10 per cent formalin in sea water and preserved in 70 per cent ethanol; deposited at the Allan Hancock Foundation, University of Southern California, Los Angeles. AHF bryozoan type 155.

*Paratype.* Colony fragments at the British Museum (Natural History). Some material is retained in the author's collection.

*Diagnosis.* A watersiporid ascophoran cheilostome without spines, avicularia or ovicells, forming encrusting unilaminar or multilaminar colonies. Frontal wall single-layered, tremocystal, perforated by 2-3 pairs of intrazoidal septulae, which are sometimes calcified, located in zoecial corners. Hypostega overlain by a darkened ectocystal epitheca; cellular parts orange-red. Embryos are brooded internally in an evagination of the vestibule. Autozooids monomorphic, possessing a proximally concave (involute) border to the aperture and operculum. Peristome imperforate, thin; periopercular ring and opercular lucidae present. Roughly half the basal surface is occupied by an uncalcified ectocystal basal window.

*Description.* Colonies are usually loosely encrusting and may be unilaminar or multilaminar. Opercula and epithecae of older zooids are dark reddish brown or black; cellular parts are orange-red. Young zooids have a transparent cuticle, so distal edges of the colony are bright brick red. The red pigment fades to brown in preservatives (Banta, 1968). Colonies may be very large; at the type locality, some masses attain the size of a man's head.

Sizes of zoecia and their apertures are variable, and the variations may be statistically significant, even between different colonies taken from the same locality. Unless otherwise stated, the measurements

given below are those of type specimens and are based on 30 measurements; the range of measured values and the standard deviation ( $\sigma$ ) are given in parentheses.

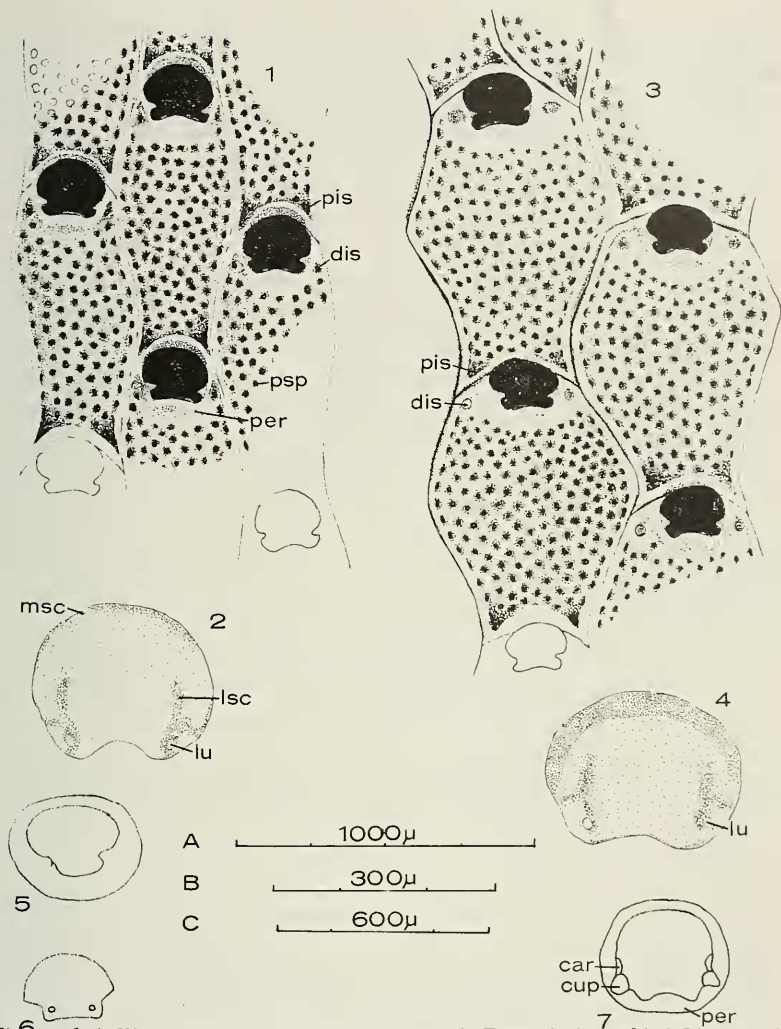
Zoecia average  $910_{\mu}$  ( $740-1115_{\mu}$ ;  $\sigma = 8.5$ ) long by  $380_{\mu}$  ( $320-460_{\mu}$ ;  $\sigma = 4.4$ ) wide. Apertures average  $225_{\mu}$  ( $190-250_{\mu}$ ;  $\sigma = 1.1$ ) wide and  $200_{\mu}$  ( $170-220_{\mu}$ ;  $\sigma = 0.88$ ) long.

The frontal wall, which is overlain by a dark epitheca, is a one-layered calcareous septum, usually called a tremocyst by bryozoologists (Mawatari, 1952; Osburn, 1952; Soule, 1961; Canu and Bassler, 1920: 47). It is perforated by approximately 150 pseudopores  $18-28_{\mu}$  in diameter and by 2-3 pairs of intrazoidal communication organs (Banta, 1969a; a report on the histology and development of these organs is in preparation). One or occasionally two pairs of intrazoidal septulae are located lateral to the aperture at about the level of the cardelles; another pair is located in the extreme proximo-lateral corners of the zoecium (Figs. 1, 3, *dis*, *pis*). Intrazoidal septulae are usually uncalcified and therefore almost indistinguishable from pseudopores in KOC1-treated material. They may be calcified, in which case each is represented by a pore plate perforated by 1-5 communication pores (Fig. 3, *dis*).

The anter of the aperture is approximately semicircular. The cardelles are triangular, blunt, and are sunk slightly below the level of the peristome, which is thin and imperforate (Figs. 1, 3, *per*). The proximal margin of the poster is concave rather than convex, as is usual in the Cheilostomata.

The operculum has the same shape as the aperture (Fig. 2; Banta, 1968, Fig. 1). Preserved opercula are dark reddish-brown as seen by transmitted light. There are two main sclerites: (1) a thin marginal sclerite at the distal border of the porta (Fig. 2, *msc*); and (2) a pair of longitudinal connecting sclerites (*lsc*). The longitudinal sclerites are extended laterally at the junction of the porta and vanna; inosculation of fibrils between the skeletal matrix and the cuticle of the operculum occurs at the distal border of these lateral projections (Banta, 1968: 501). A pair of tiny lucidae, characteristic of watersiporids, is borne on the proximal part of the vanna (Figs. 3, 4, *lu*). The operculum is surrounded by a narrow periopercular ring (Banta, 1969b).

Each zoecium is provided with approximately 8 (6-9) lateral multiporous pore plates. There are about 8 (5-10) transverse pore plates distributed near the lateral edges and base of the transverse wall. The basal wall is incompletely calcified; a large oval cuticular area, the basal window, occupies about half its surface (Banta, 1968, Figs. 2, 4, 9).



Figures 1-4. *Watersipora arcuata*, new species. 1. Frontal view of KOC1-treated zoecia; paratype; scale A. 2. Operculum of the same, viewed by transmitted light; scale B. 3. Frontal view of KOC1-treated zoecia of a variant form collected at Oceanside, California; Scale A. 4. Operculum of the same, viewed by transmitted light; scale B. Figures 5-7. *Pachycleithonia nigra* Canu and Bassler. 5. Aperture and peristome of holotype; scale C. 6. Dry, somewhat shriveled operculum of the same; scale C. 7. Aperture and peristome, after Canu and Bassler, text-fig. 6.

Abbreviations: *car*, cardelles ("condyles" of Canu and Bassler); *cup*, "cup", illustrated without explanation by Canu and Bassler; *dis*, distal intrazoidal septula; *lsc*, lateral sclerite; *lu*, lucida; *msc*, marginal sclerite; *per*, peristome; *pis*, proximal intrazoidal septula; *psp*, pseudopore.



*Variations.* *Watersipora arcuata* is moderately variable. Three specimens collected at Oceanside, California, for example, are especially distinct from the holotype. Zoecia are proportionately broader (Fig. 3), measuring about  $990\mu$  ( $750-1375\mu$ ;  $\sigma=4.9$ ) long by  $620\mu$  ( $450-750\mu$ ;  $\sigma=8.7$ ) wide. Apertures and opercula are almost exactly the same sizes as those of the holotype, measuring  $225\mu$  ( $210-240\mu$ ;  $\sigma=0.99$ ) wide by  $180\mu$  ( $175-190\mu$ ;  $\sigma=0.48$ ) long, but its opercula are darker and thicker (Fig. 4).

I have examined specimens of *Watersipora* from Waitemata Harbor, Auckland, New Zealand, presented to me by Mr. D. P. Gordon, and consider them identical to specimens of *W. arcuata* from San Diego.

*Affinities.* *Watersipora arcuata* resembles the holotype specimen of *Pachycleithonia nigra* Canu and Bassler 1930 (U S N M no. 8496) in possessing dark reddish brown opercula with lucidae, in having an evenly-perforated single-layered frontal wall, and in lacking spines, avicularia, and ovicells. Epithecae of the holotype are mostly torn away, remaining only near the edges; they are colorless. Canu and Bassler (1930: 25) indicated that epithecae of *P. nigra* are "black" [italics theirs]. The dark color has apparently been lost.

Differences between the two species are obvious. Zoecia of *P. nigra* are very large, measuring about  $1700\mu$  ( $1500-2100\mu$ ) long by  $1000\mu$  ( $800-1500\mu$ ) wide. The peristome is much heavier and thicker than in *W. arcuata* (Fig. 5).

Apertures of *P. nigra* are roughly skull-shaped and are slightly wider than long (about  $400\mu$  wide by  $300\mu$  long). The poster is not proximally concave (Fig. 5). Opercula of the holotype are shriveled and dry; I have not been able to see sclerites, but lucidae are present at a position corresponding to that in *W. arcuata* (Fig. 6).

Each zoecium of *P. nigra* possesses about 6 (5-6) pairs of multiporous lateral pore plates, each perforated by about 5 pores. Transverse pore plates are basal only; none are located near lateral edges of the transverse wall. Frontal pseudopores are smaller ( $10-15\mu$ ) and less numerous than in *W. arcuata*; intrazoidal septulae appear to be absent.

This description of *P. nigra* differs in several respects from that of Canu and Bassler (1930). The aperture is described as proximally concave; their text-figure (fig. 6), reproduced here (Fig. 7), shows an aperture similar to that of *W. arcuata*. Their photographs (Pl. 4, figs. 9-14), however, agree well with the description given here for *P. nigra*. *W. arcuata* occurs in the Galapagos Islands, the type locality of *P. nigra* (Hastings, 1930); it is possible that Canu and Bassler may have had both species in their collection.

*Watersipora arcuata* is most closely related to the highly variable

complex of species usually referred to *W. subovoidea* (d'Orbigny) [I agree with Harmer, 1957, that *Lepralia cucullata* Busk is identical to *W. subovoidea*]. *W. arcuata*, however, can be distinguished from all other watersiporids by its possession of a proximally concave aperture and an uncalcified basal window.

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